XXXV. *Astronomical Observations made at* Leicester. *By the Reverend Mr.* Ludlam, *Vicar of* Norton, *near* Leicester. *Communicated by the* Astronomer Royal.

Redde, May 11, 1775.

OBSERVATIONS FOR DETERMINING THE LATITUDE OF THE PLACE.

Zenith distances taken with an eighteen inch quadrant, made by BIRD.

1774.	β Draconis on quadrantal arch		γ Draconis on quadrantal arch.	
	Degrees	Parts.	Degrees.	Parts of 96.
	M. S.	S. V.	D. M. S.	P. S. V.
July 2	9 32	1 $5\frac{1}{2}$	1 6 40	1 1 $7\frac{3}{5}$
10	9 20	1 $5\frac{1}{4}$	1 6 34	1 1 $7\frac{1}{2}$
14	9 20	1 $5\frac{1}{3}$	1 6 34	1 1 $7\frac{1}{2}$
15	9 20	1 $5\frac{1}{6}$	1 6 28	1 1 $7\frac{1}{4}$
20	9 20	1 $5\frac{1}{8}$	1 6 27	1 1 $7\frac{1}{5}$
Mean	9 22,4	1 $5\frac{11}{40}$	1 6 32,6	1 1 $7\frac{41}{100}$
	On arch of excess.		On arch of excess.	
	M. S.	S. V.	D. M. S.	P. S. V.
June 30	8 58	1 $4\frac{1}{4}$	1 6 12	1 1 $6\frac{3}{4}$
July 4	8 50	1 $4\frac{1}{8}$	1 6 6	1 1 $6\frac{1}{3}$
9	8 58	1 $4\frac{1}{6}$	1 6 4	1 1 $6\frac{1}{2}$
16	8 58	1 $4\frac{1}{6}$	1 6 6	1 1 $6\frac{1}{2}$
18	8 58	1 $4\frac{1}{8}$	1 6 6	1 1 $6\frac{1}{3}$
Mean	8 56,4	1 $4\frac{1}{6}$	1 6 6,8	1 1 $6\frac{29}{60}$

N. B. The seconds were shewn by the micrometer screw, the fractional parts estimated by the eye.

Reduce

Reduce the parts of 96 to degrees, and take the mean between the zenith diſtances ſhewn on each ſcale, and the zenith diſtance of β Draconis on the quadrantal arch will be $9' 21'',7$, and on the arch of exceſs $8' 54''$, whence the true zenith diſtance is $9' 7'',8$, and the error of the line of collimation $13'',8$, to be ſubtracted from the numbers ſhown on the limb of the quadrant. In like manner we ſhall find the true zenith diſtance of γ Draconis $1^\circ 6' 19'',8$, and the error of the line of collimation $13'',5$. If we ſuppoſe the apparent declination of β Draconis on July 12th to be $52^\circ 28' 52'',3$, that of γ Draconis $51^\circ 31' 41'',7$, we have the latitude from the former $52^\circ 38'$, and from the latter $52^\circ 38' 1''$.

N. B. Some obſervations on theſe two ſtars in July 1772, give the ſame latitude within leſs than $2''$, but make the error of the line of collimation $23''$ to be ſubtracted. I ſuſpect the line of collimation is liable to ſmall variations in portable quadrants, if not in all.

Zenith diſtances of α Herculis with the ſtate of the barometer and thermometer.

1774.	Degrees.	Parts of 96.	Barom.	Therm.
	D. M. S.	P. S. V.	Inches.	Degrees.
June 30	37 57 36	40 3 14½	29,7	58
July 2	37 57 46	40 3 14¾	29,8	65
4	37 57 40	40 3 14½	29,7	56
9	37 57 41	40 3 14⅔	29,7	55
10	37 57 36	40 3 14⅓	29,7	55
16	37 57 36	40 3 14⅓	30,0	65
18	37 57 32	40 3 14¼	30,0	56
20	37 57 32	40 3 14⅓	29,8	58
Mean	37 57 37,4	40 3 $14\frac{11}{24}$	29,8	58,5

The mean of the zenith diſtances ſhewn on the two ſcales of diviſions is $37^{\circ}\ 57'\ 32''$. Add for refraction $43'',4$: ſubtract for line of collimation $13'',6$: and we have the true zenith diſtance $37^{\circ}\ 58'\ 1'',8$. Suppoſe the apparent declination of α Herculis on July 12th to be $14^{\circ}\ 39'\ 58'',5$, we have the latitude $52^{\circ}\ 38'$.

Zenith

Zenith diſtances of the Pole-Star.

1774.	Degrees.	Parts of 96.	Barom.	Therm.
	D. M. S.	P. S. V.	Inches.	Degrees.
Nov. 10	35 27 56	37 6 9 7/8	30,05	31
11	35 27 55	37 6 9 1/2	29,87	32
13	35 27 56	37 6 9 7/8	30,20	34
Mean	35 27 55,6	37 6 9 1/4	30,04	32,3
Dec. 6	35 28 8	37 6 10 1/8	30,27	30
15	35 28 4	37 6 10 1/4	30,03	44
Mean	35 28 6	37 6 10 3/16	30,15	37
Dec. 12	39 15 0	41 6 14 3/4	29,83	44
13	39 15 4	41 6 15	28,86	44
15	39 15 0	41 6 14 3/4	30,08	38
Mean	39 15 1,3	41 6 14 5/6	29,59	42

Take the mean between the two ſcales of diviſions, and we have the mean zenith diſtances, as follows:

Days of the month.	Obſ. zenith diſt.	Cleared of refr.
	D. M. S.	D. M. S.
Nov. 10 11 13	35 27 49,5	35 28 33,5
Dec. 6 15	35 28 0,3	35 28 44,
Dec. 12 13 15	39 14 59,3	39 15 46,7

The mean zenith diſtance of Nov. 10. 11. 13. cleared of refraction, is 35° 28′ 33″,5. To this add 7″,5 for the increaſe of apparent declination between Nov. 12. and Dec. 12. and we have the zenith diſtance on Dec. 12. (as derived from the obſervations in November) 35° 28′ 41″.

 The

The ſame from the actual obſervations on Dec. 6. and 15. is $35° 28' 44''$. The mean of theſe two, corrected for the line of collimation, gives the true zenith diſtance above the pole, $35° 28' 28'',9$. The obſervations of Dec. 12. 13. 15. cleared of refraction and corrected for the line of collimation, give the true zenith diſtance below the pole, $39° 15' 33'',1$, whence the latitude $52° 37' 59''$, and the apparent declination of the pole ſtar, Dec. 12th, $88° 6' 27'',9$. From all theſe obſervations we may conclude the latitude of (St. Martin's church in) Leiceſter is $52° 38'$, within very few ſeconds (a). From ſome obſervations made with an HADLEY's quadrant of ſix inches radius, and given in the Tranſactions for 1769, I made the latitude only $52° 37' 3''$; but thoſe obſervations cannot be ſet in competition with theſe, either for weight or number.

Occultations of γ and α Tauri, obſerved at Leiceſter, Nov. 18, 1774.

		Time by the clock. H. M. S.
Emerſion γ Tauri,		VI 27 10
Immerſion α Tauri.	Touched the limb,	XIV 59 26
	Vaniſhed,	XIV 59 30
Emerſion α Tauri inſtantaneous,		XVI 12 38

(a) The obſervations were made in Wigſton's hoſpital adjoining to the church.

The

The following obſervations ſerve to examine the clock.

Tranſits of the Sun.			
Day of the Month.	Time of the Clock. 1ſt wire.	Meridian.	3d wire.
1774.	M. S.	H. M. S.	M. S.
Nov. 17	43 35	XXIII 44 24½	45 11¾
	45 54	46 43	47 30
18	43 50	XXIII 44 39	45 26
	46 8¼	46 57	47 44

Hence the *rate* of going was conformable to mean time.

Zenith diſtances taken with the eighteen inch quadrant, to aſcertain the abſolute error of the clock, Nov. 18. Barometer 29,6 inches. Thermometer 33°.

Time by clock.	Degrees.	Parts of 96.	Object.
H. M. S.	D. M.	P. S. V.	
VIII 0 0	67 11¼	71 5 6	α Aquilæ.
2 46	67 35⅞	72 0 13½	
12 15	68 59	73 4 11	α Aquilæ.
14 37	69 20	73 7 10⅓	
48 4	56 45¼	60 4 5⅓	α Tauri.
50 55	56 20⅝	60 0 13½	
53 23	55 59½	59 5 13	
XI 1 57	55 21	59 0 5	β Geminorum.
3 54	55 3	58 5 12	
6 35	54 39	58 2 5	
XVI 26 33	58 45¾	62 5 7	α Tauri.
29 49	59 14⅓	63 1 8	
33 9	59 44	63 5 12	
36 15	60 11½	64 1 10	

From

From the mean of the two firſt zenith diſtances of α Aquilæ the clock will be found to be ſlower than mean time 14″. By the ſecond pair of α Aquilæ, 13″. By the next three zenith diſtances of α Tauri, 13″. By the next three of β Geminorum, 16″, By the laſt four of α Tauri, 17″; the error of the line of collimation being 13″,6 as before. The mean of all theſe gives the clock 14″,6 ſlower than mean time. Hence,

		Solar time.
		H. M. S.
Emerſion of γ Tauri,		VI 41 48,4
Immerſion α Tauri.	Touched limb,	XV 13 59,6
	Vaniſhed,	XV 14 3,6
Emerſion α Tauri,	inſtantaneous,	XVI 27 10,8

The emerſion of α Tauri was obſerved at Greenwich at xvi^h 34′ 36″,8 ſolar time.

N. B. The immerſion of ζ Tauri (behind the Moon) which was obſerved at Leiceſter, April 28, 1770, at IX^h 45′ 44″ ſolar time, was alſo obſerved at Greenwich at IX^h 51′ 28″,6 ſolar time. See Phil. Tranſ. for 1770.

XXXVI. *Some*